

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-216527

(43)Date of publication of application : 02.08.2002

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(51)Int.Cl. F21V 8/00

F21V 17/00

G02F 1/13357

// F21Y101:02

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(54) SURFACE LIGHTING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a surface lighting device that can enhance coupling between the light guide and the point light source.

SOLUTION: In this surface lighting device, a pawl 23 of an upper frame 21 is fitted to a recess 20 of LED 6 and the LED 6 is pushed to the light guide 4 by the spring effect in the light guide 4 direction (a spring effect in the length direction of the light guide body 4) in a fitting condition. Thereby, the light guide 4 and the LED 6 are kept in close contact and positioned securely and in its coupling between the light guide 4 and the LED 6 is well enhanced. Furthermore, as the pawl 23 of the upper frame 21 is fitted to the recess 20 of the LED 6, the LED 6 is made not to shift in a rectangular direction (the

arrow B direction) in the length direction of the light guide 4, and thereby, the light guide 4 and the LED 6 are more securely positioned, and the coupling between the light guide 4 and the LED 6 is more enhanced.

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[LEGAL STATUS [Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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## CLAIMS

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[Claim(s)]

[Claim 1] It has a frame holding the light source, and said transparency substrate and said light source of the shape of a straight line arranged near the side edge side of the transparency substrate which consists of a translucency ingredient, and this transparency substrate. Said light source The transparent material which consists of a transparent material of the shape of a straight line by which contiguity arrangement is carried out at least in accordance with the whole surface among the side edge sides of said transparency substrate, It is the field-like lighting system constituted from the punctiform light source arranged among the both ends of this transparent material at least at one side. Said frame It has the tabular frame body which is arranged at the inferior-surface-of-tongue side of a printed wired board, or is arranged so that said transparent material may be carried out in between and said printed wired board may be countered, and is prolonged along with said transparent material. It is the field-like lighting system which forms the pawl which contacts said punctiform light source in the edge of this frame body, and is characterized by this pawl pressing said punctiform light source to said transparent material.

[Claim 2] It is the field-like lighting system according to claim 1 which said punctiform light source has a hollow in the opposite side side of said transparent material and the field which counters, and is characterized by said pawl fitting into said hollow.

[Claim 3] Said punctiform light source is a field-like lighting system according to claim 2 characterized by forming said hollow between said both-ends sides as solder was given to the both-ends side of the direction which intersects perpendicularly with the longitudinal direction of said transparent material and this solder section was avoided.

[Claim 4] Said hollow is a field-like lighting system according to claim 2 or 3 characterized by being the configuration prolonged towards a groove in the concerned frame body arrangement surface part and opposed face side which counters from the frame body arrangement surface part equivalent to the side in which the frame body in said punctiform light source is arranged.

[Claim 5] Said frame is a field-like lighting system given in either from claim 1 characterized by consisting of spring nature ingredients to claim 4.

[Claim 6] It is a field-like lighting system given in either from claim 1 which said transparent material is carried out in between, and the punctiform light source is arranged to the both ends, and is characterized by forming said pawl at least in one side of the both ends of a frame body corresponding to the punctiform light source of

the both ends of said transparent material to claim 5.

[Claim 7] It is a field-like lighting system given in either from claim 1 which the punctiform light source is arranged at the end section of said transparent material, a reflecting plate is arranged to the other end, and said pawl is formed in the end section of a frame body corresponding to the punctiform light source of the end section of said transparent material, and is characterized by the other end side of a frame body holding a transparent material through said reflecting plate to claim 5.

[Claim 8] Said punctiform light source is a field-like lighting system given in either from claim 1 characterized by being LED to claim 7.

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#### DETAILED DESCRIPTION

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##### [Detailed Description of the Invention]

###### [0001]

[Field of the Invention] This invention is especially used as a lighting means of a liquid crystal display about the field-like lighting system used for lighting means, such as a signboard and various reflective mold displays.

###### [0002]

[Description of the Prior Art] Since the liquid crystal display which operates with a low power has the descriptions, such as a thin shape and a light weight, the need as a display centering on a computer application is mainly growing. Since the liquid crystal which is the configuration member of a liquid crystal display does not emit light itself,

the lighting means for observing an image unlike luminescence mold components, such as the Braun tube, is required for it. Especially, in the demand of thin-shape-izing in recent years, the field-like lighting system of a sheet metal-like side light method (light guide plate method) is used as a lighting means for irradiating a liquid crystal display in many cases.

[0003] There are some which are shown in drawing 7 thru/or drawing 12 as an example of the field-like lighting system of such a side light method. In drawing 7 and drawing 8, the profile configuration of this field-like lighting system 1 is carried out from the transparency substrate (guide plate) 2 which consists of a translucency ingredient, and the light source 3 of the shape of a straight line which was made to approach 1 side-edge side 2a of the transparency substrate 2, and has been arranged. The liquid crystal display which is not illustrated to the inferior-surface-of-tongue side of the transparency substrate 2 is arranged, and this field-like lighting system 1 is used as supplemental lighting of that liquid crystal display.

[0004] The transparency substrate 2 is formed in the so-called wedge with which the board thickness becomes thin gradually as it keeps away from said 1 side-edge side 2a. the reflecting plate 7 which the light source 3 meets end section 4a of the transparent material (guide rod) 4 which consists of a linear transparent material by which contiguity arrangement is carried out along with 1 side-edge side 2a of the transparency substrate 2, and a transparent material 4, is arranged, and is met and arranged at LED6 (punctiform light source) mounted in FPC5 (printed wired board) which consists of an insulating material, and other end 4b of a transparent material 4 -- since -- the profile configuration is carried out.

[0005] moreover, to 4d (the 2nd page of transparent material) of opposite side sides of field (1st page of transparent material) 4c which attend the transparency substrate 2 in a transparent material 4 In spite of establishing an optical-path conversion means 8 by which a cross-section configuration consists of slot 8a of an abbreviation triangle, and flat part 8b formed between these slot 8a and arranging LED6 at end section 4a The beam of light which carried out incidence is made to be emitted to homogeneity in 1st page 4 of transparent material c from end section 4a of a transparent material 4.

[0006] The whole surface of the transparency substrate 2 (on drawing 7.) Hereafter, it is called a top face. The light reflex pattern 9 which consists of slot 9a and flat part 9b is formed in 2b, and he is trying for brightness to become homogeneity mostly also in which location of the transparency substrate 2, without being influenced from a transparent material 4 to distance.

[0007] The groove hollow 20 which extends in the vertical direction is formed in the

abbreviation center section of the opposed face in which LED6 counters nothing and a contact side with a transparent material 4 in an abbreviation rectangle. LED6 is in the condition which met end section 4a of a transparent material 4, and has been arranged, as shown in drawing 7 , drawing 10 , and drawing 11 . Solder is given to the both-ends sides 6a and 6b of the direction which intersects perpendicularly with the longitudinal direction of a transparent material 4 (the part to which solder was given is called solder section S.). It connects with the copper foil (illustration abbreviation) with which FPC5 was equipped electrically, and the terminal which is not illustrated is carried in FPC5 in this condition.

[0008] FPC5 has FPC body 5a of the abbreviation rectangle in which LED6 grade is mounted, and FPC standup wall 5b formed so that it might start in the end section of FPC body 5a. FPC standup wall 5b meets LED6, and he intervenes between LED6 and frame standup Itabe 10b, and is trying to prevent that the solder section S connects with the metal bottom frame 10 (frame standup Itabe 10b) too hastily so that it may mention later.

[0009] Moreover, this field-like lighting system 1 is equipped with the metal frame (bottom frame 10) arranged at the inferior-surface-of-tongue side of FPC5 as shown in drawing 7 , drawing 9 , drawing 10 , and drawing 11 , and the abbreviation tabular frame (top frame 11) arranged so that a transparent material 4 may be carried out in between and FPC5 may be countered, and he is trying to hold the transparency substrate 2 and the light source 3. The profile configuration of the bottom frame 10 is done by the tabular frame body (bottom frame body 10a) which meets the inferior-surface-of-tongue side of FPC5, and is prolonged along with a transparent material 4, and standup Itabe (frame standup Itabe 10b) who does an abbreviation rectangular cross with bottom frame body 10a, and starts to the end section side ( drawing 10 right-hand side) of bottom frame body 10a. It changes the other end ( drawing 10 left-hand side) of bottom frame body 10a into the condition (condition that the attaching part which is not illustrated was prepared) of having been mutually fixed with the transparency substrate 2, and it makes possible the press to the transparent material 4 of LED6 by frame standup Itabe 10b mentioned later.

[0010] The bottom frame 10 makes frame standup Itabe 10b meet end section 4a of a transparent material 4 through FPC standup wall 5b, and he is trying to press LED6 to a transparent material 4 through FPC standup wall 5b. And when a bottom frame presses LED6 to a transparent material 4 in this way, he aims at improvement in the joint effectiveness between a transparent material 4 and LED6, and is trying to absorb the variation in the tolerance of a member.

[0011]

[Problem(s) to be Solved by the Invention] By the way, in the field-like lighting system, in order to acquire a good optical property, it is required that it should position certainly while sticking a transparent material and LED good, as a result a transparent material and joint effectiveness of LED should be made good. On the other hand, with the above-mentioned conventional technique, as shown in drawing 11 and drawing 12, in order to perform the press to the transparent material 4 of LED6 through FPC5 (FPC standup wall 5b), big thrust was not obtained but constraint was received in improvement in the part and joint effectiveness. Moreover, with the above-mentioned conventional technique, LED6 is a direction (the drawing 11 vertical direction.) which intersects perpendicularly with the longitudinal direction of a transparent material 4. For convenience, it is called a lengthwise direction. It is easy to shift to T and was easy to invite decline in joint effectiveness to it in connection with this.

[0012] This invention was made in view of the above-mentioned situation, and aims at offering the field-like lighting system which can aim at improvement in the joint effectiveness between a transparent material and the punctiform light source.

[0013]

[Means for Solving the Problem] The transparency substrate with which invention according to claim 1 consists of a translucency ingredient, and the light source of the shape of a straight line arranged near the side edge side of this transparency substrate, It has a frame holding said transparency substrate and said light source. Said light source The transparent material which consists of a transparent material of the shape of a straight line by which contiguity arrangement is carried out at least in accordance with the whole surface among the side edge sides of said transparency substrate, It is the field-like lighting system constituted from the punctiform light source arranged among the both ends of this transparent material at least at one side. Said frame It has the tabular frame body which is arranged at the inferior-surface-of-tongue side of a printed wired board, or is arranged so that said transparent material may be carried out in between and said printed wired board may be countered, and is prolonged along with said transparent material. The pawl which contacts said punctiform light source is formed in the edge of this frame body, and it is characterized by this pawl pressing said punctiform light source to said transparent material.

[0014] Invention according to claim 2 has a hollow in a configuration according to claim 1 in the opposite side side of the field where said punctiform light source counters with said transparent material, and it is characterized by said pawl fitting into

said hollow. Invention according to claim 3 is characterized by forming said hollow between said both-ends sides, as solder was given to the both-ends side of the direction which intersects perpendicularly with the longitudinal direction of said transparent material and said punctiform light source avoided this solder section in a configuration according to claim 2. Invention according to claim 4 is characterized by said hollow being a configuration prolonged towards a groove in the concerned frame body arrangement surface part and opposed face side which counters from the frame body arrangement surface part equivalent to the side in which the frame body in said punctiform light source is arranged in a configuration according to claim 2 or 3.

[0015] Invention according to claim 5 is characterized by said frame consisting of claims 1 with a spring nature ingredient in a configuration given in either to claim 4. Invention according to claim 6 carries out said transparent material in between in a configuration given in either from claim 1 to claim 5, the punctiform light source is arranged to the both ends, and said pawl is characterized by being formed at least in one side of the both ends of a frame body corresponding to the punctiform light source of the both ends of said transparent material. In a configuration given in either from claim 1 to claim 5, the punctiform light source is arranged at the end section of said transparent material, invention according to claim 7 arranges a reflecting plate to the other end, said pawl is formed in the end section of a frame body corresponding to the punctiform light source of the end section of said transparent material, and the other end side of a frame body is characterized by holding a transparent material through said reflecting plate. Invention according to claim 8 is characterized by said punctiform light source being LED in a configuration given in either from claim 1 to claim 7.

[0016]

[Embodiment of the Invention] Field-like lighting-system 1A concerning the gestalt of the 1st operation of this invention is explained based on drawing 1 thru/or drawing 4. In addition, a sign equivalent to drawing 7 thru/or drawing 12 about drawing 7 thru/or a part equivalent to drawing 12, and a member is attached, and the explanation is omitted suitably. As shown in drawing 1 and drawing 2, the profile configuration of this field-like lighting-system 1A is carried out from the transparency substrate 2 which consists of a translucency ingredient, and the light source 3 of the shape of a straight line which was made to approach 1 side-edge side 2a of the transparency substrate 2, and has been arranged. The liquid crystal display which is not illustrated to the inferior-surface-of-tongue side of the transparency substrate 2 is arranged, and this field-like lighting-system 1A is used as supplemental lighting of that liquid crystal

display.

[0017] The light source 3 meets end section 4a of the transparent material 4 which consists of a long tabular transparent material by which contiguity arrangement is carried out along with 1 side-edge side 2a of the transparence substrate 2, and a transparent material 4, and is arranged, and the profile configuration is carried out from LED6 (punctiform light source) which consists of light emitting diode mounted in FPC5, and the reflecting plate 7 which meets other end 4b of a transparent material 4, and is arranged.

[0018] moreover, to 4d (the 2nd page of transparent material) of opposite side sides of field (1st page of transparent material) 4c which attend the transparence substrate 2 in a transparent material 4 In spite of establishing an optical-path conversion means 8 by which a cross-section configuration consists of slot 8a of an abbreviation triangle, and flat part 8b formed between these slot 8a and arranging LED6 at end section 4a The beam of light which carried out incidence is made to be emitted to homogeneity in 1st page 4of transparent material c from end section 4a of a transparent material 4.

[0019] The whole surface of the transparence substrate 2 (on drawing 1.) Hereafter, it is called a top face. The light reflex pattern 9 which consists of slot 9a and flat part 9b is formed in 2b, and he is trying for brightness to become homogeneity mostly also in which location of the transparence substrate 2, without being influenced from a transparent material 4 to distance.

[0020] The groove hollow 20 where LED6 is prolonged in the vertical direction in an abbreviation rectangle in the abbreviation center section of 6d of the opposite sides of nothing and contact side 6c with a transparent material 4 is formed. The hollow 20 is made into the configuration prolonged towards a groove in concerned frame body arrangement surface part 6e [ equivalent to the side (on drawing 3 ) in which top frame body 21a in LED6 mentioned later is arranged / frame body arrangement surface part 6e to ], and 6f side of opposed faces which counter. LED6 is in the condition which met end section 4a of a transparent material 4, and has been arranged, as shown in drawing 1 , drawing 3 , and drawing 4 . Solder is given to the both-ends sides 6a and 6b of the direction which intersects perpendicularly with the longitudinal direction of a transparent material 4 (the part to which solder was given is called solder section S.). It connects with the copper foil (illustration abbreviation) with which FPC5 was equipped electrically, and the terminal which is not illustrated is carried in FPC5 in this condition. Since the hollow 20 of LED6 was formed in the abbreviation center section of 6d of the transparent material anti-opposed faces as mentioned above, and solder was given to the both-ends 6a and 6b side, as said

hollow 20 avoids the solder section S, it is formed between the both-ends 6a side and the 6b side.

[0021] It has FPC body 5a of the abbreviation rectangle in which LED6 grade is mounted, FPC body 5a is equipped with said copper foil, and FPC5 is connected to the external power which is not illustrated through copper foil.

[0022] Moreover, this field-like lighting-system 1A is equipped with the abbreviation tabular frame (bottom frame 22) of the metal arranged so that a transparent material 4 and FPC5 may be carried out to the frame made from a spring nature ingredient (top frame 21) which consists of a metal arranged at the inferior-surface-of-tongue side of FPC5 in between and the top frame 21 may be countered, as shown in drawing 3 and drawing 4, or the product made of resin, and he is trying to hold the transparency substrate 2 and the light source 3. (Illustration abbreviation) The profile configuration of the top frame 21 is carried out from the tabular pawl 23 which carries out an abbreviation rectangular cross (it considers as an acute angle slightly) to top frame body 21a, is formed in the tabular frame body [ which is prolonged along with a transparent material 4 ] (top frame body 21a), and end section side ( drawing 3 right-hand side) of top frame body 21a, and fits into the hollow 20 of LED6. The other end ( drawing 3 left-hand side) of top frame body 21a is in the condition (condition that the attaching part which is not illustrated was prepared) of pressing a transparent material 4 through a reflecting plate, and makes possible the press to the transparent material 4 of LED6 by the pawl 23. That is, while a pawl 23 fits into said hollow 20, it demonstrates the spring force to transparent material 4 direction in the state of fitting, and he is trying to press LED6 to a transparent material 4.

[0023] While the pawl 23 of the top frame 21 fits into the hollow 20 of LED6 with the gestalt of this operation constituted as mentioned above, the spring force (spring force of the longitudinal direction of a transparent material 4) to transparent material 4 direction is demonstrated in the state of fitting, and LED6 is pressed to a transparent material 4. For this reason, while being stuck to a transparent material 4 and LED good, it is positioned certainly, as a result a transparent material 4 and joint effectiveness of LED can be made good.

[0024] Although big thrust was not obtained but constraint was received in improvement in the part and joint effectiveness with the conventional technique mentioned above in order to perform the press to the transparent material 4 of LED6 through FPC5 (FPC standup wall 5b) With the gestalt of this operation, since a pawl 23 contacts LED6, the spring force of a pawl 23 is made to act on LED6 directly and the press to the transparent material 4 of LED6 is performed, a transparent material 4 and

joint effectiveness of LED6 can be made big.

[0025] Moreover, since the pawl 23 of the top frame 21 has fitted into the hollow 20 of LED6, LED6 can control shifting in the direction (the direction of drawing 3 arrow-head B) which intersects perpendicularly with the longitudinal direction of a transparent material 4, can ensure positioning of a transparent material 4 and LED6 at this rate, and can improve further a transparent material 4 and the joint effectiveness of LED6.

[0026] With the gestalt of this operation, the hollow 20 of LED6 is formed in the abbreviation center section of 6d of the transparent material anti-opposed faces as mentioned above, solder is given to the both-ends 6a and 6b side (forming the solder section S), and as a hollow 20 avoids the solder section S, it is formed between the both-ends 6a side and the 6b side. For this reason, even if it becomes depressed about the pawl 23 of the top frame 21 and fits into 20, generating of closed-circuit failure can be prevented so that a pawl 23 may not contact the solder section S.

[0027] With the gestalt of this operation, in the configuration which carries out an abbreviation rectangular cross at top frame body 21a, the pawl 23 of the top frame 21 is simple, and can manufacture easily, and improvement in productivity can be aimed at. In addition, the pawl 23 of such a top frame 21 may replace with what is tabular, and may constitute as follows. Namely, for example, the pawl body formed by carrying out the abbreviation rectangular cross (it considering as an acute angle slightly) of the pawl 23 of the top frame 21 to top frame body 21a while making the hollow of LED6 into the shape of a hole, such as circular and a rectangle, (illustration abbreviation), You may constitute from the pawl fitting section (illustration abbreviation) which intersects perpendicularly with a pawl body, is formed and fits into the hollow of the shape of a hole, such as circular [ said ] and a rectangle, so that an abbreviation L typeface may be made with a pawl body.

[0028] Although the top frames 21 and 21A made the example the case where it consisted of metals, they may be replaced with this and a resin ingredient may constitute them from the gestalt of the above-mentioned implementation.

[0029] Although the case where a pawl 23 was formed in the top frame 21 (top frame body 21a) was made into the example with the gestalt of the above-mentioned implementation, you may make it this invention form a pawl 24 in the bottom frame 22, as shown not only in this but in drawing 5 (gestalt of the 2nd operation). That is, in drawing 5, the bottom frame 22 is constituted from a pawl 24 by which crookedness formation is carried out by the end section (drawing 5 right-hand side) of tabular bottom frame body 22a arranged at the inferior-surface-of-tongue side of FPC5, and

bottom frame body 22a. It is held at a transparent material 4 and the bottom frame 22 is made not to be moved to the longitudinal direction (drawing 5 longitudinal direction) of a transparent material 4 by the other end side (drawing 5 left-hand side) of bottom frame body 22a. The pawl 24 consists of the pawl end face section 25 of the abbreviation L typeface which is installed in bottom frame body 22a, and is prolonged in the LED6 side ranging over 5d (drawing 5 right-hand side) of edges of FPC5 so that an abbreviation KO typeface may be made with bottom frame body 22a, and a tabular tiptoe edge 26 which crookedness formation is carried out at the tip side of the pawl end face section 25, and fits into the hollow 20 of LED6.

[0030] A pawl 24 acts like the pawl 23 of the gestalt of the 1st operation, and the gestalt of this 2nd operation generates the spring force so that LED6 may be pressed to a transparent material 4. And like the gestalt of the 1st operation, positive positioning of a transparent material 4 and LED6 can be achieved, as a result a transparent material 4 and joint effectiveness of LED6 can be made good.

[0031] Although the case where LED6 (punctiform light source) was formed in end section 4a of a transparent material 4 was made into the example with the gestalt of the above-mentioned implementation, you may make it form LED6 (punctiform light source) in the both-ends 4a [ of a transparent material 4 ], and 4b side, without arranging a reflecting plate 7, as it replaces with this and is shown in drawing 6 (gestalt of the 3rd operation). In drawing 6 top frame 21A Top frame body 21a, The tabular pawl formed in the end section (drawing 6 right-hand side) of top frame body 21a by carrying out an abbreviation rectangular cross (it considering as an acute angle slightly) to top frame body 21a (it is called a 1 edge side pawl for convenience.) The tabular pawl formed in 27 and the other end (drawing 6 left-hand side) of top frame body 21a by carrying out an abbreviation rectangular cross (it considering as an acute angle slightly) to top frame body 21a (it is called an other end side pawl for convenience.) 28 -- since -- the profile configuration is carried out.

[0032] The 1 edge side pawl 27 fits into the hollow 20 of LED6 by the side of the end of a transparent material 4, and the other end side pawl 28 fits into the hollow 20 of LED6 by the side of the other end of a transparent material 4. The 1 edge side pawl 27 of top frame 21A and the other end side pawl 28 are in the condition which fitted into each hollow 20 of LED6, as mentioned above, and they demonstrate the spring force to the direction of a partner.

[0033] With the gestalt of this 3rd operation, the spring force is generated so that the 1 edge side pawl 27 and the other end side pawl 28 may both press LED6 to a transparent material 4 like the pawl 23 of the gestalt of the 1st operation. And like the

gestalt of the 1st operation, positive positioning of a transparent material 4 and LED6 can be achieved, as a result a transparent material 4 and joint effectiveness of LED6 can be made good.

[0034]

[Effect of the Invention] According to invention given in either from claim 1 to claim 8, since the pawl of a frame presses the punctiform light source to a transparent material in contact with the punctiform light source, while being stuck to a transparent material and the punctiform light source good, it is positioned certainly, as a result joint effectiveness of a transparent material and the punctiform light source can be made good.

[0035] Since the pawl of a frame fits into the hollow of the punctiform light source according to invention according to claim 2 While pressing the punctiform light source to the longitudinal direction of a transparent material, pressing the punctiform light source to a transparent material and making good joint effectiveness of a transparent material and the punctiform light source Migration of the punctiform light source in the direction which intersects perpendicularly with the longitudinal direction of a transparent material can be regulated, positioning of the part, a transparent material, and the punctiform light source can be ensured, and the joint effectiveness of a transparent material and the punctiform light source can be raised further.

[0036] Since according to invention according to claim 3 the solder section is avoided and the press to the transparent material of the punctiform light source by the pawl of a frame can be performed, even if a frame is metal, generating of closed-circuit failure is avoidable.

[0037] According to invention according to claim 4, in the configuration which carries out an abbreviation rectangular cross at a top frame body, the pawl of a top frame is simple, and can manufacture easily, and improvement in productivity can be aimed at. Since the frame consists of ingredients which have spring nature according to invention according to claim 5, generating of the force which presses the punctiform light source to a transparent material can be attained easily. Since both the force in which the pawl of the both ends of a frame body presses the punctiform light source to a transparent material is generated according to invention given in claims 6 and 7, improvement in joint effectiveness can be achieved efficiently.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective view showing the gestalt of the 1st operation of this invention.

[Drawing 2] It is the top view showing typically the transparency substrate of drawing 1 , and the arrangement relation of the light source (a transparent material, LED, and reflecting plate).

[Drawing 3] It is the perspective view showing typically the arrangement relation between LED of drawing 1 , a transparent material, and a top frame.

[Drawing 4] It is the bottom view showing typically the arrangement relation between the hollow of LED of drawing 2 , and the pawl of a top frame.

[Drawing 5] It is the front view showing the gestalt of the 2nd operation of this invention typically.

[Drawing 6] It is the front view showing the gestalt of the 3rd operation of this invention typically.

[Drawing 7] It is the perspective view showing an example of the conventional field-like lighting system.

[Drawing 8] It is the top view showing typically the transparency substrate of drawing 7 , and the arrangement relation of the light source (a transparent material, LED, and reflecting plate).

[Drawing 9] It is the top view showing typically the arrangement relation between the transparency substrate of drawing 7 , the light source, and a bottom frame.

[Drawing 10] It is the front view showing the field-like lighting system of drawing 7 typically.

[Drawing 11] It is the top view showing the field-like lighting system of drawing 7

typically.

[Drawing 12] It is drawing showing typically the condition of pressing LED to a transparent material through FPC.

[Description of Notations]

1A Field-like lighting system

2 Transparency Substrate

4 Transparent Material

5 FPC (Printed Wired Board)

6 LED (Punctiform Light Source)

7 Reflecting Plate

20 Hollow

21 Top Frame

23 Pawl

(19)日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開2002-216527

(P2002-216527A)

(43)公開日 平成14年8月2日(2002.8.2)

(51)Int.Cl.<sup>7</sup>  
F 21 V 8/00

識別記号  
6 0 1

F I  
F 21 V 8/00

テマコード\*(参考)  
6 0 1 E 2 H 0 9 1

17/00  
G 02 F 1/13357  
// F 21 Y 101:02

17/00  
G 02 F 1/13357  
F 21 Y 101:02

6 0 1 D

T

審査請求 未請求 請求項の数 8 O.L (全 7 頁)

(21)出願番号 特願2001-8967(P2001-8967)

(22)出願日 平成13年1月17日(2001.1.17)

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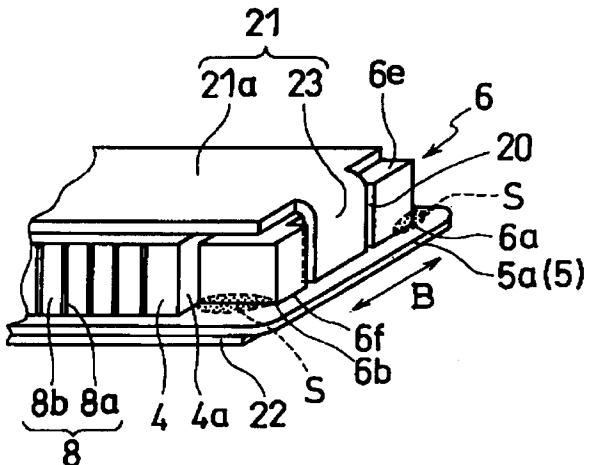
F ターム(参考) 2H091 FA23Z FA41Z FA45Z LA30

(54)【発明の名称】面状照明装置

(57)【要約】

【課題】導光体及び点状光源間の結合効率の向上を図ることができる面状照明装置を提供する。

【解決手段】上側フレーム21の爪23がLED6の窪み20に嵌合すると共に、嵌合状態で導光体4方向へのばね力(導光体4の長手方向のばね力)を發揮し、LED6を導光体4に押圧する。このため、導光体4及びLEDが良好に密着されると共に確実に位置決めされ、ひいては導光体4及びLEDの結合効率を良好なものにすることができる。また、上側フレーム21の爪23がLED6の窪み20に嵌合しているので、LED6が導光体4の長手方向と直交する方向(矢印B方向)にずれることを抑制し、この分、導光体4及びLED6の位置決めをより確実に行え、導光体4及びLED6の結合効率をさらに向上できる。



## 【特許請求の範囲】

【請求項1】 透光性材料からなる透明基板と、該透明基板の側端面付近に配置される直線状の光源と、前記透明基板及び前記光源を保持するフレームとを有し、前記光源は、前記透明基板の側端面のうち少なくとも一面に沿って近接配置される直線状の透光性材料からなる導光体と、該導光体の両端部のうち少なくとも一方に配置される点状光源とから構成した面状照明装置であって、前記フレームは、プリント配線板の下面側に配置されるか又は前記導光体を間にして前記プリント配線板に対向するように配置されて前記導光体に沿って延びる板状のフレーム本体を有し、該フレーム本体の端部には前記点状光源に当接する爪を設け、該爪は前記点状光源を前記導光体に押圧することを特徴とする面状照明装置。

【請求項2】 前記点状光源は、前記導光体と対向する面の反対側面に窪みを有し、前記爪は前記窪みに嵌合することを特徴とする請求項1に記載の面状照明装置。

【請求項3】 前記点状光源は、前記導光体の長手方向と直交する方向の両端側に半田が施され、該半田部を避けるようにして前記両端側の間に前記窪みを形成したことを特徴とする請求項2に記載の面状照明装置。

【請求項4】 前記窪みは、前記点状光源におけるフレーム本体が配設される側に相当するフレーム本体配設面部から当該フレーム本体配設面部と対向する対向面側に溝状に向けて延びる形状であることを特徴とする請求項2または請求項3に記載の面状照明装置。

【請求項5】 前記フレームはばね性材料で構成されることを特徴とする請求項1から請求項4までのいずれかに記載の面状照明装置。

【請求項6】 前記導光体を間にてその両端部に点状光源が配置され、前記爪は、前記導光体の両端部の点状光源に対応してフレーム本体の両端部の少なくとも一方に形成されることを特徴とする請求項1から請求項5までのいずれかに記載の面状照明装置。

【請求項7】 前記導光体の一端部に点状光源が配置され、他端部には反射板を配置し、前記爪は前記導光体の一端部の点状光源に対応してフレーム本体の一端部に形成され、フレーム本体の他端部側は前記反射板を介して導光体を保持することを特徴とする請求項1から請求項5までのいずれかに記載の面状照明装置。

【請求項8】 前記点状光源はLEDであることを特徴とする請求項1から請求項7までのいずれかに記載の面状照明装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】 本発明は、看板や各種反射型表示装置等の照明手段に用いられる面状照明装置に関するものであり、特に、液晶表示装置の照明手段として用いられるものである。

## 【0002】

【従来の技術】 低消費電力で動作する液晶表示装置は、薄型、軽量等の特徴があるので、主にコンピュータ用途を中心とした表示装置としての需要が増大している。液晶表示装置の構成部材である液晶は、自ら発光しないため、ブラウン管等の発光型素子と異なり、画像を観察するための照明手段が必要である。特に、近年の薄型化の要求の中では、液晶表示装置を照射するための照明手段として、薄板状のサイドライト方式（導光板方式）の面状照明装置を使用することが多い。

【0003】 このようなサイドライト方式の面状照明装置の一例として図7ないし図12に示すものがある。図7及び図8において、この面状照明装置1は、透光性材料からなる透明基板（ガイドプレート）2と、透明基板2の一側端面2aに近接させて配置された直線状の光源3とから大略構成されている。透明基板2の下面側に図示しない液晶表示装置が配置され、この面状照明装置1は、その液晶表示装置の補助照明として用いられるようになっている。

【0004】 透明基板2は、前記一側端面2aから遠ざかるにしたがって、その板厚が徐々に薄くなる、いわゆる楔形に形成されている。光源3は、透明基板2の一側端面2aに沿って近接配置される線状の透光性材料からなる導光体（ガイドロッド）4と、導光体4の一端部4aに対面して配置され、絶縁材料からなるFPC5（プリント配線板）に実装されるLED6（点状光源）と、導光体4の他端部4bに対面して配置される反射板7と、から大略構成されている。

【0005】 また、導光体4における透明基板2に臨む面（導光体第1面）4cの反対側面（導光体第2面）4dには、断面形状が略三角形の溝部8aと、該溝部8aの間に形成される平坦部8bとからなる光路変換手段8が設けられており、LED6が一端部4aに配置されているにも関わらず、導光体4の一端部4aから入射した光線が導光体第1面4cにおいて均一に放射されるようしている。

【0006】 透明基板2の一面（図7上側。以下、上面という。）2bには、溝部9a及び平坦部9bからなる光反射パターン9が形成されており、導光体4からの距離に左右されることなく透明基板2の何れの位置においても明るさがほぼ均一になるようしている。

【0007】 LED6は、略矩形をなし、導光体4との当接面に対向する対向面の略中央部には、上下方向に延びる溝状の窪み20が形成されている。LED6は、図7、図10及び図11に示すように、導光体4の一端部4aに対面して配置された状態で、導光体4の長手方向と直交する方向の両端側6a、6bに半田が施され（半田が施された部分を半田部Sという。）、図示しない端子がFPC5に備えられた銅箔（図示省略）に電気的に接続され、この状態でFPC5に搭載されている。

【0008】FPC5は、LED6等が実装される略矩形のFPC本体5aと、FPC本体5aの一端部に立ち上がるよう形成されたFPC立上り壁部5bとを有している。FPC立上り壁部5bはLED6と対面し、かつ、後述するように、LED6とフレーム立上り板部10bとの間に介在され、半田部Sが金属製の下側フレーム10（フレーム立上り板部10b）と短絡することを防止するようにしている。

【0009】また、この面状照明装置1には、図7、図9、図10及び図11に示すように、FPC5の下面側に配置される金属製のフレーム（下側フレーム10）と、導光体4を間にしてFPC5に対向するように配置される略板状のフレーム（上側フレーム11）とが備えられており、透明基板2及び光源3を保持するようにしている。下側フレーム10は、FPC5の下面側に對面して導光体4に沿って延びる板状のフレーム本体（下側フレーム本体10a）と、下側フレーム本体10aの一端部側（図10右側）に下側フレーム本体10aと略直交して立上がる立上り板部（フレーム立上り板部10b）とから大略構成されている。下側フレーム本体10aの他端部（図10左側）は透明基板2と互いに固定された状態（図示しない保持部が設けられた状態）にされており、後述するフレーム立上り板部10bによるLED6の導光体4への押圧を可能なものにしている。

【0010】下側フレーム10は、フレーム立上り板部10bを、FPC立上り壁部5bを介して導光体4の一端部4aに對面させ、FPC立上り壁部5bを介して、LED6を導光体4に押圧するようにしている。そして、このように下側フレームがLED6を導光体4に押圧することにより、導光体4及びLED6間の結合効率の向上を図り、また、部材の公差のバラツキを吸収するようしている。

#### 【0011】

【発明が解決しようとする課題】ところで、面状照明装置では、良好な光特性を得るために、導光体及びLEDを良好に密着させると共に確実に位置決めし、ひいては導光体及びLEDの結合効率を良好なものにすることが要求されている。これに対し、上記従来技術では、図11及び図12に示すように、LED6の導光体4への押圧をFPC5（FPC立上り壁部5b）を介して行うため、大きな押圧力が得られず、その分、結合効率の向上に制約を受けていた。また、上記従来技術では、LED6は、導光体4の長手方向と直交する方向（図11上下方向。便宜上、縦方向という。）Tには、ずれやすく、これに伴い結合効率の低下を招きやすかった。

【0012】本発明は、上記事情に鑑みてなされたもので、導光体及び点状光源間の結合効率の向上を図ることができる面状照明装置を提供することを目的とする。

#### 【0013】

【課題を解決するための手段】請求項1に記載の發明

は、透光性材料からなる透明基板と、該透明基板の側端面付近に配置される直線状の光源と、前記透明基板及び前記光源を保持するフレームとを有し、前記光源は、前記透明基板の側端面のうち少なくとも一面に沿って近接配置される直線状の透明材料からなる導光体と、該導光体の両端部のうち少なくとも一方に配置される点状光源とから構成した面状照明装置であって、前記フレームは、プリント配線板の下面側に配置されるか又は前記導光体を間にして前記プリント配線板に対向するように配置されて前記導光体に沿って延びる板状のフレーム本体を有し、該フレーム本体の端部には前記点状光源に当接する爪を設け、該爪は前記点状光源を前記導光体に押圧することを特徴とする。

【0014】請求項2に記載の發明は、請求項1に記載の構成において、前記点状光源は、前記導光体と對向する面の反対側面に窪みを有し、前記爪は前記窪みに嵌合することを特徴とする。請求項3に記載の發明は、請求項2に記載の構成において、前記点状光源は、前記導光体の長手方向と直交する方向の両端側に半田が施され、該半田部を避けるようにして前記両端側の間に前記窪みを形成したことを特徴とする。請求項4に記載の發明は、請求項2または請求項3に記載の構成において、前記窪みは、前記点状光源におけるフレーム本体が配設される側に相当するフレーム本体配設面部から当該フレーム本体配設面部と對向する対向面側に溝状に向けて延びる形状であることを特徴とする。

【0015】請求項5に記載の發明は、請求項1から請求項4までのいずれかに記載の構成において、前記フレームはばね性材料で構成されることを特徴とする。請求項6に記載の發明は、請求項1から請求項5までのいずれかに記載の構成において、前記導光体を間にしてその両端部に点状光源が配置され、前記爪は、前記導光体の両端部の点状光源に対応してフレーム本体の両端部の少なくとも一方に形成されることを特徴とする。請求項7に記載の發明は、請求項1から請求項5までのいずれかに記載の構成において、前記導光体の一端部に点状光源が配置され、他端部には反射板を配置し、前記爪は前記導光体の一端部の点状光源に対応してフレーム本体の一端部に形成され、フレーム本体の他端部側は前記反射板を介して導光体を保持することを特徴とする。請求項8に記載の發明は、請求項1から請求項7までのいずれかに記載の構成において、前記点状光源はLEDであることを特徴とする。

#### 【0016】

【発明の実施の形態】本発明の第1実施の形態に係る面状照明装置1Aを図1ないし図4に基づいて説明する。なお、図7ないし図12と同等の部分、部材については図7ないし図12と同等の符号を付し、その説明は、適宜、省略する。この面状照明装置1Aは、図1及び図2に示すように、透光性材料からなる透明基板2と、透明

基板2の一側端面2aに近接させて配置された直線状の光源3とから大略構成されている。透明基板2の下面側に図示しない液晶表示装置が配置され、この面状照明装置1Aは、その液晶表示装置の補助照明として用いられるようになっている。

【0017】光源3は、透明基板2の一側端面2aに沿って近接配置される長板状の透明材料からなる導光体4と、導光体4の一端部4aに対面して配置され、FPC5に実装される発光ダイオードからなるLED6（点状光源）と、導光体4の他端部4bに対面して配置される反射板7とから大略構成されている。

【0018】また、導光体4における透明基板2に臨む面（導光体第1面）4cの反対側面（導光体第2面）4dには、断面形状が略三角形の溝部8aと、該溝部8aの間に形成される平坦部8bとからなる光路変換手段8が設けられており、LED6が一端部4aに配置されているにも関わらず、導光体4の一端部4aから入射した光線が導光体第1面4cにおいて均一に放射されるようしている。

【0019】透明基板2的一面（図1上側。以下、上面という。）2bには、溝部9a及び平坦部9bからなる光反射パターン9が形成されており、導光体4からの距離に左右されることなく透明基板2の何れの位置においても明るさがほぼ均一になるようしている。

【0020】LED6は、略矩形をなし、導光体4との当接面6cの反対面6dの略中央部には、上下方向に延びる溝状の窪み20が形成されている。窪み20は、LED6における後述する上側フレーム本体21aが配設される側（図3上側）に相当するフレーム本体配設面部6eから当該フレーム本体配設面部6eと対向する対向面6f側に溝状に向けて延びる形状とされている。LED6は、図1、図3及び図4に示すように、導光体4の一端部4aに対面して配置された状態で、導光体4の長手方向と直交する方向の両端側6a、6bに半田が施され（半田が施された部分を半田部Sという。）、図示しない端子がFPC5に備えられた銅箔（図示省略）に電気的に接続され、この状態でFPC5に搭載されている。LED6の窪み20を、上述したように導光体反対向面6dの略中央部に形成し、両端6a、6b側に半田が施されたことから、前記窪み20は半田部Sを避けるようにして両端6a、6b側の間に形成されている。

【0021】FPC5は、LED6等が実装される略矩形のFPC本体5aを有し、FPC本体5aに前記銅箔が備えられており、銅箔を介して図示しない外部電源等に接続されている。

【0022】また、この面状照明装置1Aには、図3、図4に示すように、FPC5の下面側に配置される金属からなるばね性材料製のフレーム（上側フレーム21）と、導光体4及びFPC5を間に上側フレーム21に対向するように配置される金属製または樹脂製の略板

状のフレーム（下側フレーム22）とが備えられており、透明基板2及び光源3を保持するようにしている。

（図示省略）上側フレーム21は、導光体4に沿って延びる板状のフレーム本体（上側フレーム本体21a）と、上側フレーム本体21aの一端部側（図3右側）に上側フレーム本体21aと略直交（わずかに鋭角とする）して形成されLED6の窪み20に嵌合する板状の爪23とから大略構成されている。上側フレーム本体21aの他端部（図3左側）は反射板を介して導光体4を押圧する状態（図示しない保持部が設けられた状態）になっており、爪23によるLED6の導光体4への押圧を可能なものにしている。すなわち、爪23は、前記窪み20に嵌合するようになっていると共に、嵌合状態で導光体4方向へのばね力を發揮し、LED6を導光体4に押圧するようしている。

【0023】上述したように構成された本実施の形態では、上側フレーム21の爪23がLED6の窪み20に嵌合すると共に、嵌合状態で導光体4方向へのばね力（導光体4の長手方向のばね力）を發揮し、LED6を導光体4に押圧する。このため、導光体4及びLEDが良好に密着されると共に確実に位置決めされ、ひいては導光体4及びLEDの結合効率を良好なものにすることができる。

【0024】上述した従来技術では、LED6の導光体4への押圧をFPC5（FPC立上り壁部5b）を介して行うため、大きな押圧力が得られず、その分、結合効率の向上に制約を受けていたが、本実施の形態では、爪23がLED6に当接して、爪23のばね力を直接的にLED6に作用させてLED6の導光体4への押圧を行うので、導光体4及びLED6の結合効率を大きなものにことができる。

【0025】また、上側フレーム21の爪23がLED6の窪み20に嵌合しているので、LED6が導光体4の長手方向と直交する方向（図3矢印B方向）にずれることを抑制し、この分、導光体4及びLED6の位置決めをより確実に行え、導光体4及びLED6の結合効率をさらに向上できる。

【0026】本実施の形態では、LED6の窪み20を、上述したように導光体反対向面6dの略中央部に形成し、両端6a、6b側に半田を施し（半田部Sを設け）、窪み20は半田部Sを避けるようにして両端6a、6b側の間に形成されている。このため、上側フレーム21の爪23を窪み20に嵌合しても、爪23が半田部Sに接触するようなことがなく、短絡故障の発生を防止できる。

【0027】本実施の形態では、上側フレーム21の爪23が上側フレーム本体21aに略直交する形状で簡易であり、容易に製作することができ、生産性の向上を図ることができる。なお、このような上側フレーム21の爪23が板状であるものに代えて、次のように構成して

もよい。すなわち、例えばLED6の窪みを円形、矩形などの穴状とする一方、上側フレーム21の爪23を、上側フレーム本体21aと略直交（わずかに鋭角とする）して形成される爪本体（図示省略）と、爪本体と共に略L字形をなすように爪本体と直交して形成され前記円形、矩形などの穴状の窪みに嵌合する爪嵌合部（図示省略）とから構成してもよい。

【0028】上記実施の形態では、上側フレーム21、21Aは金属から構成される場合を例にしたが、これに代えて樹脂材料で構成してもよい。

【0029】上記実施の形態では、上側フレーム21（上側フレーム本体21a）に爪23を設けた場合を例にしたが、本発明はこれに限らず、例えば図5に示すように、下側フレーム22に爪24を設けるようにしてもよい（第2実施の形態）。すなわち、図5において、下側フレーム22は、FPC5の下面側に配置される板状の下側フレーム本体22aと、下側フレーム本体22aの一端部（図5右側）に屈曲形成される爪24とから構成されている。下側フレーム本体22aの他端側（図5左側）は導光体4に保持され、下側フレーム22は導光体4の長手方向（図5左右方向）に移動しないようにされている。爪24は、下側フレーム本体22aと共に略コ字形をなすように下側フレーム本体22aに延設されFPC5の端部5d（図5右側）を跨いでLED6側に延びる略L字形の爪基端部25と、爪基端部25の先端側に屈曲形成されLED6の窪み20に嵌合する板状の爪先端部26とから構成されている。

【0030】この第2実施の形態は、爪24が第1実施の形態の爪23と同様に作用し、LED6を導光体4に押圧するようにはね力を発生する。そして、第1実施の形態と同様にして、導光体4及びLED6の確実な位置決めを果たし、ひいては導光体4及びLED6の結合効率を良好なものにすることができる。

【0031】上記実施の形態では、導光体4の一端部4aにLED6（点状光源）を設けた場合を例にしたが、これに代えて図6に示すように、反射板7を配置せずに導光体4の両端4a、4b側にLED6（点状光源）を設けるようにしてもよい（第3実施の形態）。図6において、上側フレーム21Aは、上側フレーム本体21aと、上側フレーム本体21aの一端部（図6右側）に上側フレーム本体21aと略直交（わずかに鋭角とする）して形成された板状の爪（便宜上、一端部側爪という。）27と、上側フレーム本体21aの他端部（図6左側）に上側フレーム本体21aと略直交（わずかに鋭角とする）して形成された板状の爪（便宜上、他端部側爪という。）28と、から大略構成されている。

【0032】一端部側爪27は、導光体4の一端側のLED6の窪み20に嵌合し、他端部側爪28は、導光体4の他端側のLED6の窪み20に嵌合するようになっている。上側フレーム21Aの一端部側爪27及び他端

部側爪28は、上述したようにLED6の各窪み20に嵌合した状態で、相手方向へのばね力を発揮するようになっている。

【0033】この第3実施の形態では、一端部側爪27及び他端部側爪28が共に、第1実施の形態の爪23と同様にしてLED6を導光体4に押圧するようにはね力を発生する。そして、第1実施の形態と同様にして、導光体4及びLED6の確実な位置決めを果たし、ひいては導光体4及びLED6の結合効率を良好なものにすることができる。

【0034】

【発明の効果】請求項1から請求項8までのいずれかに記載の発明によれば、フレームの爪が点状光源に当接して点状光源を導光体に押圧するので、導光体及び点状光源が良好に密着されると共に確実に位置決めされ、ひいては導光体及び点状光源の結合効率を良好なものにすることができる。

【0035】請求項2に記載の発明によれば、フレームの爪が点状光源の窪みに嵌合するので、点状光源を導光体の長手方向に点状光源を導光体に押圧して導光体及び点状光源の結合効率を良好なものにすると共に、導光体の長手方向と直交する方向への点状光源の移動を規制し、その分、導光体及び点状光源の位置決めをより確実に行え、導光体及び点状光源の結合効率をさらに向上させることができる。

【0036】請求項3に記載の発明によれば、フレームの爪による点状光源の導光体への押圧を半田部を避けて行えるので、フレームが金属製であっても短絡故障の発生を回避することができる。

【0037】請求項4に記載の発明によれば、上側フレームの爪が上側フレーム本体に略直交する形状で簡易であり、容易に製作することができ生産性の向上を図ることができ。請求項5に記載の発明によれば、フレームはばね性を有する材料で構成されているので、点状光源を導光体に押圧する力の発生を容易に達成することができる。請求項6、7に記載の発明によれば、フレーム本体の両端部の爪が点状光源を導光体に押圧する力を共に発生するので、結合効率の向上を効率よく果たすことができる。

【図面の簡単な説明】

【図1】本発明の第1実施の形態を示す分解斜視図である。

【図2】図1の透明基板及び光源（導光体、LED及び反射板）の配置関係を模式的に示す平面図である。

【図3】図1のLED、導光体及び上側フレームの配置関係を模式的に示す斜視図である。

【図4】図2のLEDの窪みと上側フレームの爪の配置関係を模式的に示す下面図である。

【図5】本発明の第2実施の形態を模式的に示す正面図である。

【図6】本発明の第3実施の形態を模式的に示す正面図である。

【図7】従来の面状照明装置の一例を示す斜視図である。

【図8】図7の透明基板及び光源(導光体、LED及び反射板)の配置関係を模式的に示す平面図である。

【図9】図7の透明基板、光源及び下側フレームの配置関係を模式的に示す平面図である。

【図10】図7の面状照明装置を模式的に示す正面図である。

【図11】図7の面状照明装置を模式的に示す平面図である。

\* 【図12】FPCを介してLEDを導光体へ押圧する状態を模式的に示す図である。

【符号の説明】

1A 面状照明装置

2 透明基板

4 導光体

5 FPC(プリント配線板)

6 LED(点状光源)

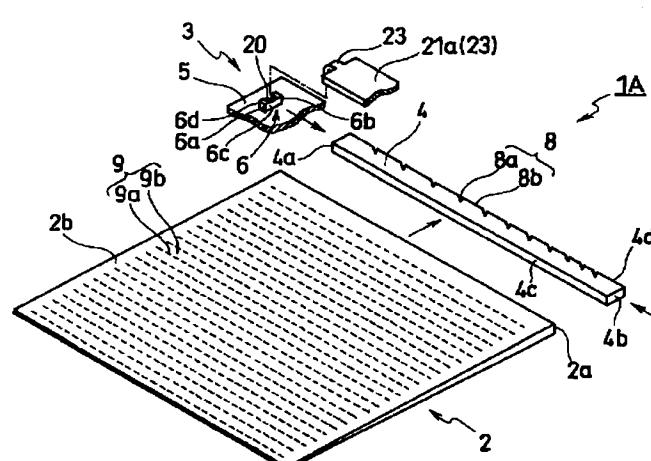
7 反射板

10 20 窪み

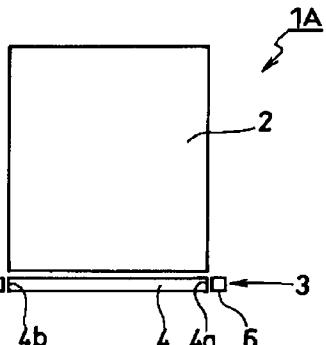
21 上側フレーム

\* 23 爪

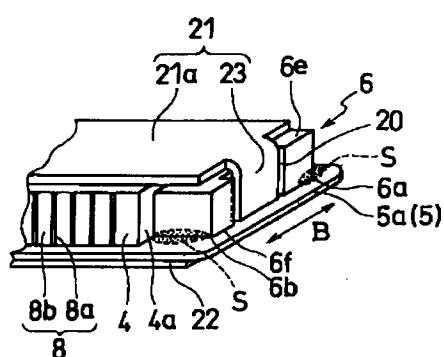
【図1】



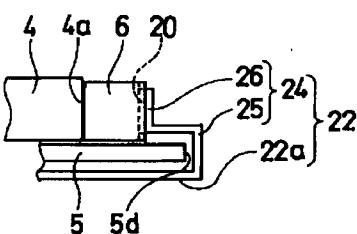
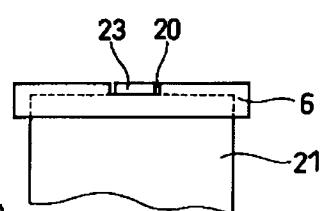
【図2】



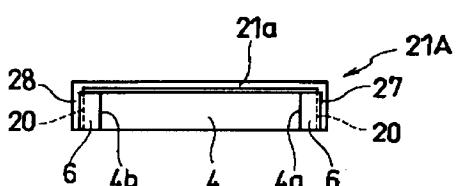
【図3】



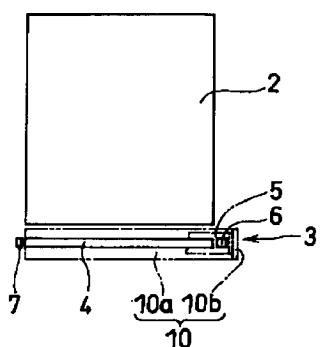
【図4】



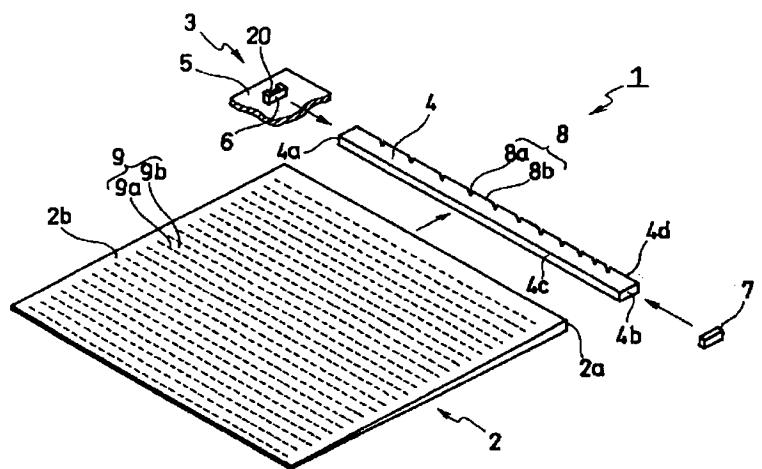
【図6】



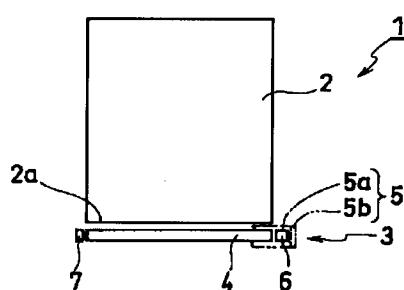
【図7】



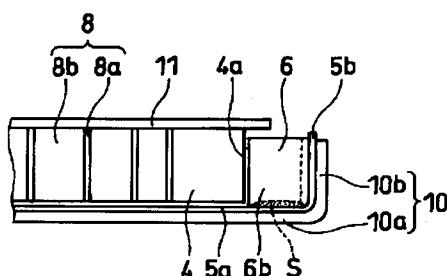
【図7】



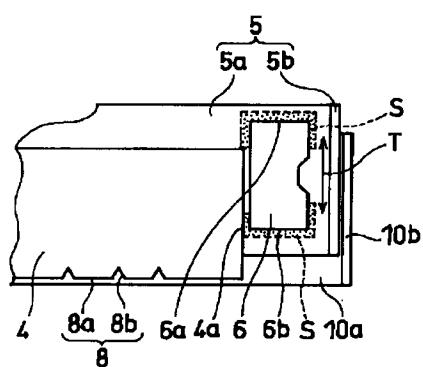
【図8】



【図10】



【図11】



【図12】

